Agilent G2747A Nickel Catalyst Kit

6890 Gas Chromatograph

Installation Guide

Agilent Technologies

Notices

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Safety Notices

CAUTION

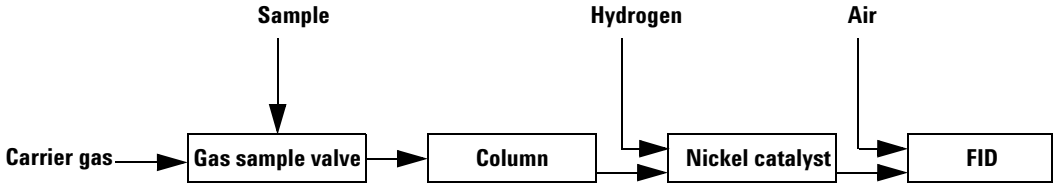
A **CAUTION** notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in damage to the product or loss of important data. Do not proceed beyond a **CAUTION** notice until the indicated conditions are fully understood and met.

WARNING

A WARNING notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in personal injury or death. Do not proceed beyond a WARNING notice until the indicated conditions are fully understood and met.

Installation and Maintenance

The Nickel Catalyst Kit, accessory G2747A, is used on the 6890 Series gas chromatograph for trace analysis of CO and CO_2 with a flame ionization detector (FID). The gas sample is separated on the column and passed over the hot catalyst in the presence of hydrogen, which converts the CO and CO_2 peaks to CH_4.



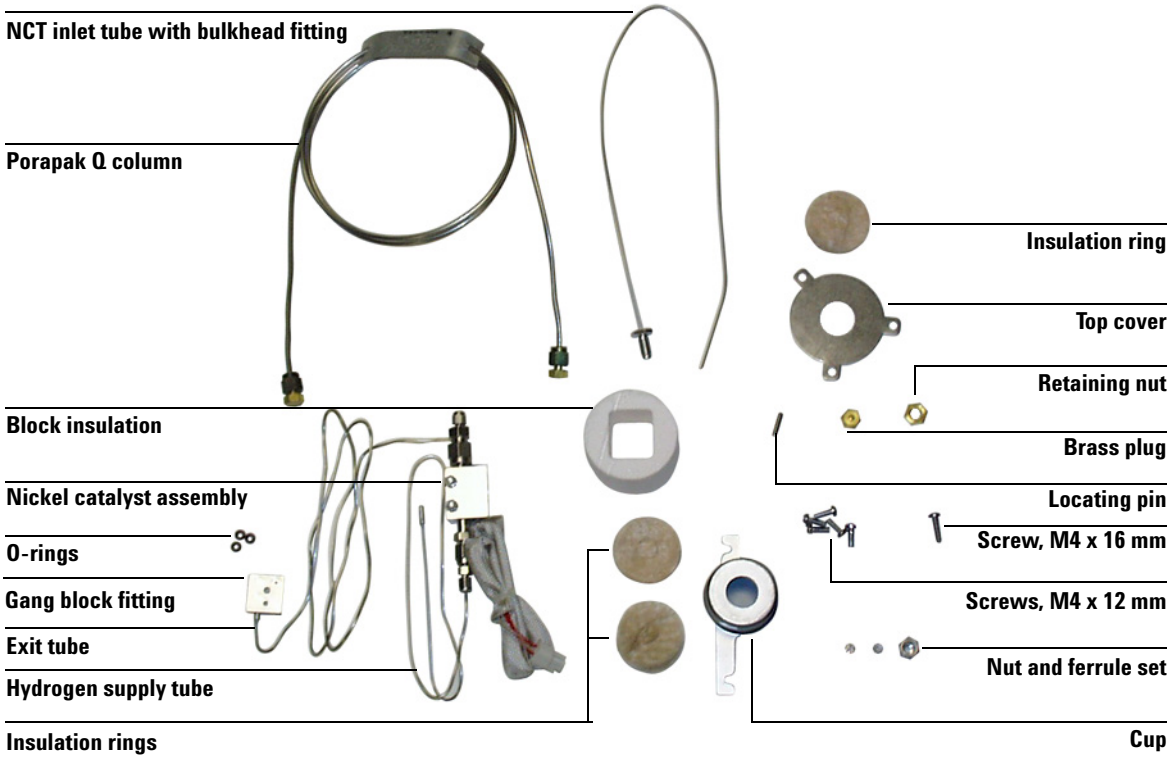
Requirements

- An available inlet position. The accessory is usually installed in the back position. If you remove an existing inlet system to make space, be sure to remove its flow module as well.
- Two nut plates (part no. 05890-80660) installed in the oven. They are provided with Heated Valve Box kits G1580A and G1581A.
- The packed/capillary (universal) version of the FID.

Table 1 Kit contents

Kit G2747A	Qty.
Nickel catalyst assembly	1
Porapak Q column	1
Inlet tube with bulkhead fitting	1
Retaining nut	1
Block insulation	1
Top cover	1
Cup	1
Insulation ring	3
Locating pin	1
Brass plug, 1/8-inch	1
O-ring	3
Nut and ferrule set, 1/8-inch stainless steel	1
Screw, M4 x 12 mm, chrome-plated	5
Screw, M4 x 16 mm	1
Performance evaluation sample, can	1
Installation sheet (this document)	1

Part identification



Tools required

- Torx™ T-20 drive
- Flat blade screwdriver
- Open end wrenches

Prepare the instrument

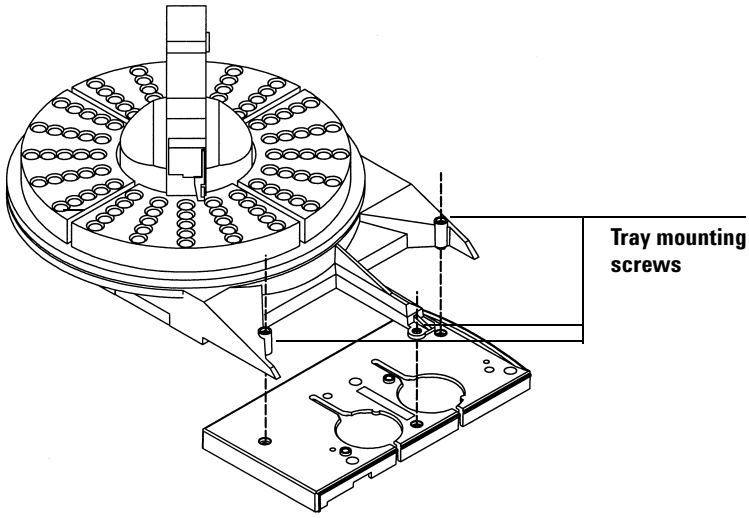
WARNING **Hydrogen (H_2) is flammable and is an explosion hazard when mixed with air in an enclosed space (for example, the oven). In any application using H_2, turn off the supply at its source before working on the instrument.**

1. Turn off the oven and heated zones and let them cool.
2. Turn off all gases at their source.
3. Turn the main power line switch off.
4. Unplug the line power cord.
5. Remove the column. Remove any hardware attached to the FID (liner, column/liner nuts, ferrules, makeup gas adapter, etc.).

6 If a 7683 autosampler is installed:

a Lift the injector from the GC mounting post and set it aside.

b Remove the tray by loosening/removing the three mounting screws.

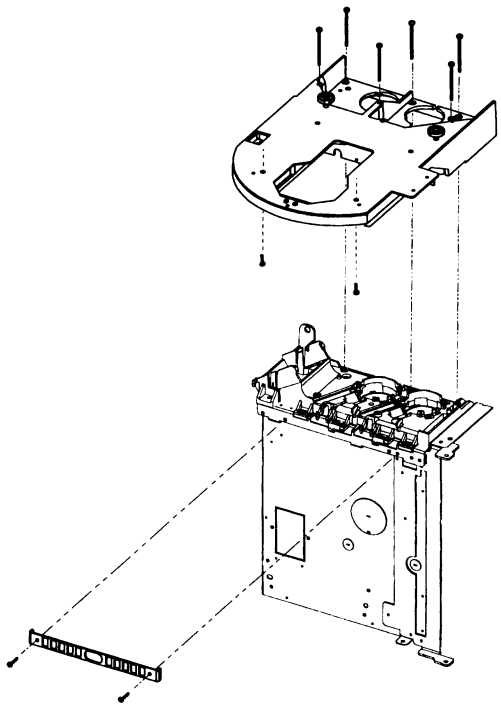


c Proceed to step 8.

7 If a 7673 autosampler is installed:

a Remove the tray from the autosampler.

b Lift the autosampler from its mounting bracket and set it aside.

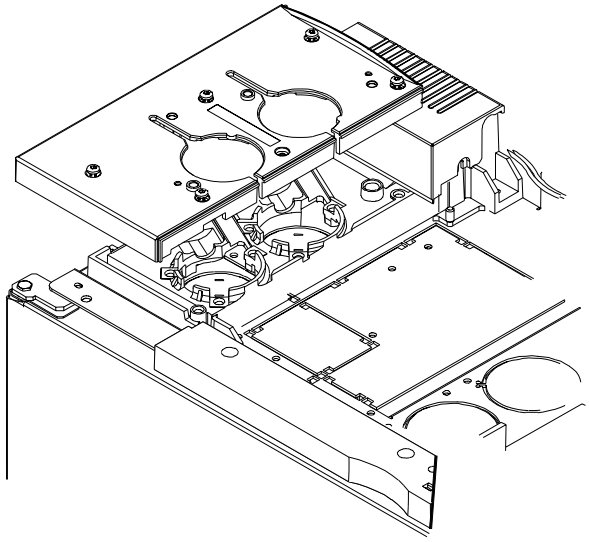


c Remove two screws underneath the autosampler bracket.

d Remove two screws holding the tray mounting strap.

e Remove six screws on top of the bracket. Lift the bracket off.

8 Remove the injection port cover, if present, by loosening five Torx T-20 screws and lifting it up.



9 Loosen the two screws on the top edge of the left side panel. Slide the panel slightly to the rear and lift it off.

10 Remove the electronics carrier top cover by grasping it at the back edge and lifting upwards until its catch releases, then pull it towards the back of the instrument.

11 Remove the top part of the back panel.

12 Remove the pneumatics cover and the RFI shield underneath it.

Install the Nickel Catalyst Tube (NCT)

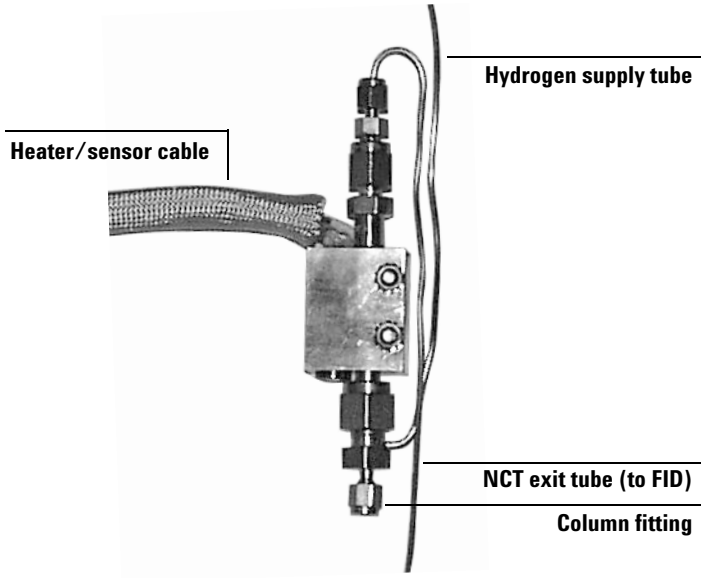
These instructions assume that you are installing the NCT in the back inlet position.

CAUTION The insulation on the GC is made of refractory ceramic fibers (RCF). Ventilate your work area. Wear long sleeves, gloves, safety glasses, and a disposable dust/mist respirator. Dispose of insulation in a sealed plastic bag.

1 If present, remove the cover plate from the back inlet mounting location and remove the pre-cut insulation below it.

2 Install the block insulation in the back inlet position.

3 Prepare the NCT by bending the hydrogen supply tube and the NCT exit tube along the side of the catalyst chamber.



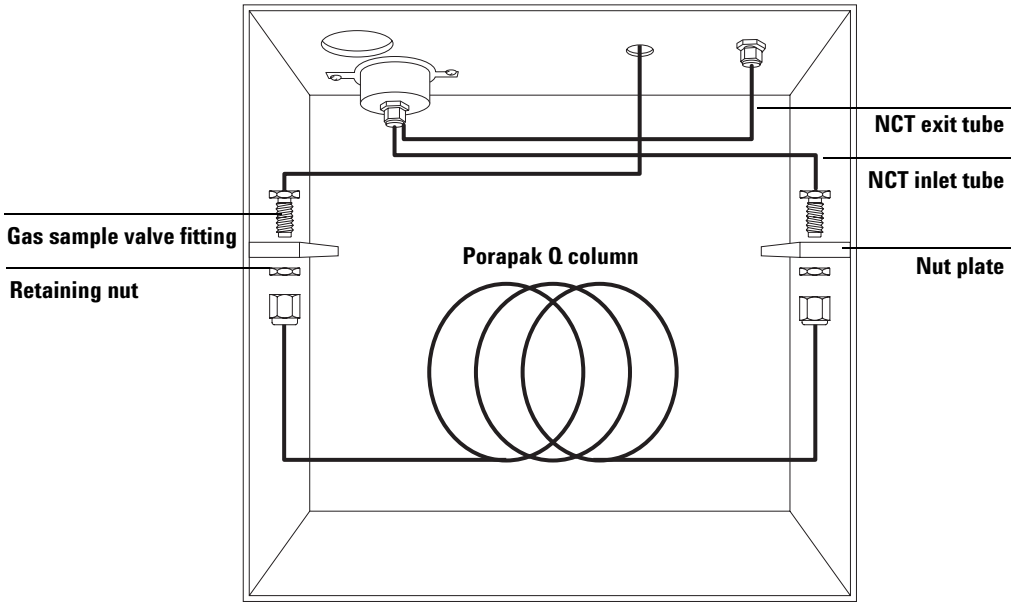
4 Install the NCT in the block insulation with the column fitting and exit tube inside the oven. Avoid getting insulation inside the exit tube. Feed the heater/sensor cable out the top.

5 Use the removed insulation (tear apart as needed) to fill any space around the NCT.

6 Remove the center plug from one insulation ring. Place the insulation ring on top of the NCT. Install the cover plate on top of the ring and secure with three screws.

7 Remove the plugs from the remaining insulation rings. Place the rings in the insulation cup. Install the cup inside the oven over the NCT exit tube and the bottom fitting. Avoid getting insulation inside the exit tube. Secure the cup to the oven with two screws.

8 Connect the NCT exit tube to the FID inlet. Assemble a 1/8-inch stainless steel nut and front and back ferrule onto the tube. Fully insert the tube, ferrules, and nut into the FID base. Tighten the nut finger-tight, then use a wrench to tighten the nut an additional 1/2 to 3/4 turn.



9 Install the bulkhead fitting end of the inlet tube to the nut plate on the right side of the oven. Secure with the retaining nut.

10 Connect the NCT inlet tube to the fitting on the bottom of the NCT. Assemble a 1/8-inch stainless steel nut and front and back ferrule onto the tube. Fully insert the tube, ferrules, and nut into the NCT fitting. Tighten the nut finger-tight, then use a wrench to tighten the nut an additional 1/2 to 3/4 turn.

11 Install the Porapak Q column between the gas sample valve fitting on the inlet side of the oven and the NCT inlet tube on the detector side of the oven.

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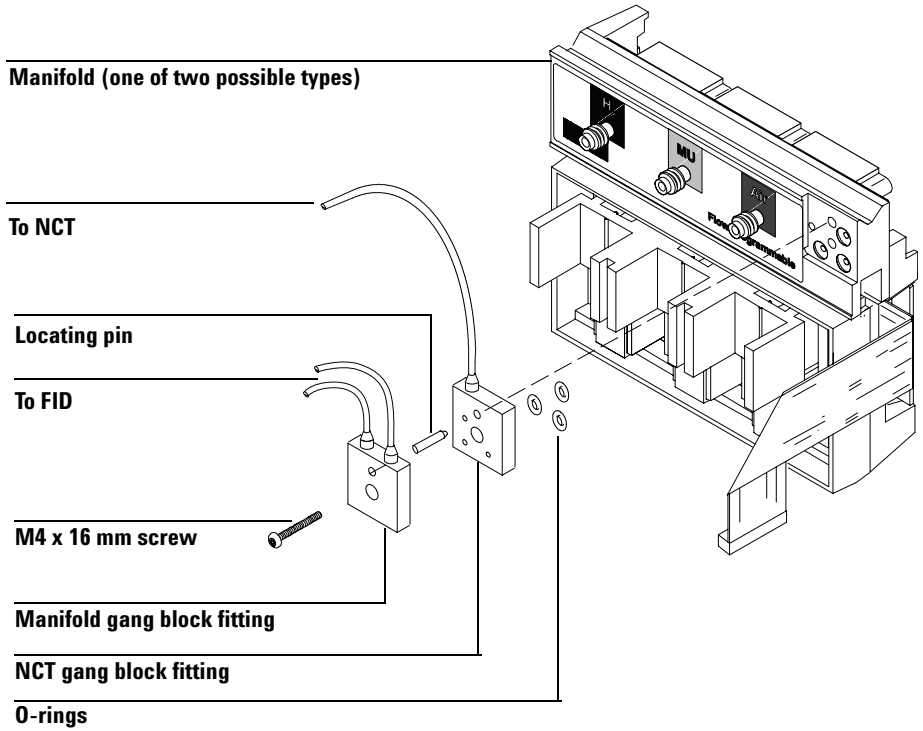
12 Turn off the hydrogen at its source. Locate the flow manifold that feeds the FID being used.



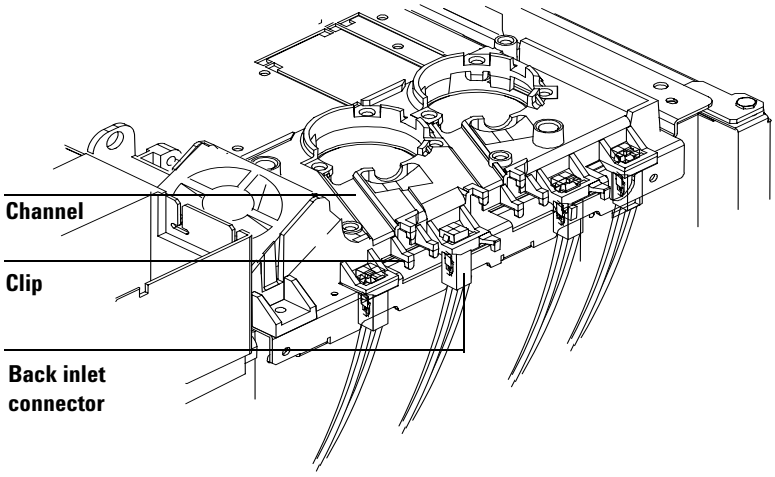
13 Disconnect the manifold gang block fitting from the manifold.

14 Use pliers to remove the locating pin protruding from the face of the manifold gang block fitting. Replace it with the longer pin supplied in this kit.

15 Place the NCT gang block fitting, with three O-rings, on the manifold. Place the manifold gang block fitting, also with

O-rings, on top of it and secure with the long screw from this kit.

16 Route the heater/sensor cable through the channel to the left and under the clip. Plug it into the back inlet connector.



17 Restore gas flows and leak test the new installation.

18 Reinstall the panels and covers. Reconnect the instrument power cord and restore power.

Verifying performance

1 If any heated zone is turned on, turn it off and allow it to cool. DO NOT heat any heated zone.

2 Set the gas flow rates.

Table 2 Gas flow rates for a standard FID installation

Gas	Flow rate, mL/min
Carrier (helium)	30
FID hydrogen	30
FID air	400

Table 3 Gas flow rates for a TCD/FID in-series installation

Gas	Flow rate, mL/min
Carrier (helium)	30
TCD switching flow	25
FID hydrogen	45
FID air	500

CAUTION Hydrogen flow is pressure-controlled, where an FID provides a known resistance. The NCT increases flow resistance, so that the calibration is no longer valid. You must measure hydrogen flow with a bubble or similar meter. See your GC Operating Manual for details.

3 Allow helium and hydrogen to flow through the system for 15 minutes.

4 Carefully check the column and supply fittings for leaks. Air leaks can damage the catalyst.

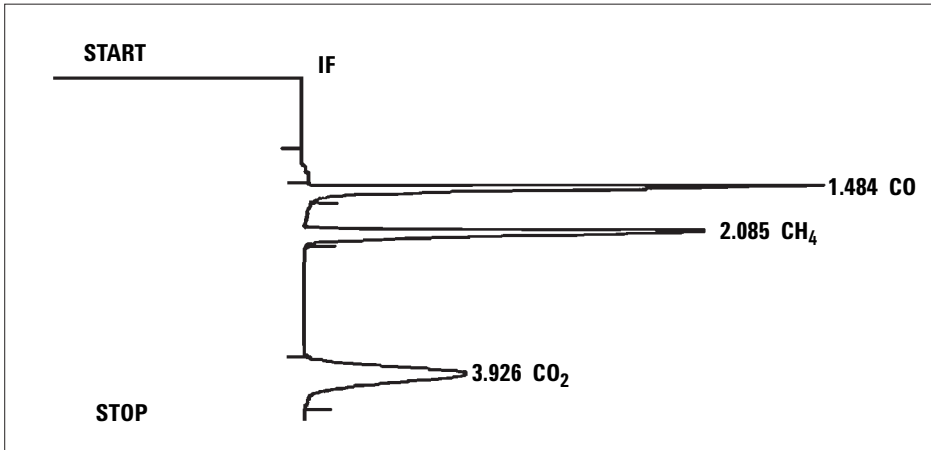
5 Set the nickel catalyst tube temperature (back inlet temperature) to 375°C and the FID temperature to 300°C. Allow them to condition for one hour. While the zones are heating, ignite the FID flame.

6 After 1 hour, set the following temperatures:

Zone	°C
Oven	35
FID	as desired
Nickel Catalyst	375
TCD (if in use)	as desired

When the temperatures have stabilized, the system is ready for use.

7 Load the valve sample loop with the nickel catalyst performance evaluation sample (a quick press of the can button) and start the run. The chromatogram should be similar to the one in the figure. (CO_2 may be larger due to the presence of air in the sample.)



Repacking the catalyst

The nickel catalyst can be damaged by exposure to air. If performance is significantly degraded, repack the catalyst tube.

WARNING

Hydrogen (H_2) is flammable and is an explosion hazard when mixed with air in an enclosed space (for example, the oven). In any application using H_2, turn off the supply at its source before working on the instrument.

Both nickel oxide and some forms of silicon oxide are considered carcinogens for humans. Perform all work in a fume hood and wear cotton gloves at all times. Remove any spills with an HEPA-type vacuum cleaner, avoiding any action that raises dust. Alert your company's Safety group if a spill occurs.

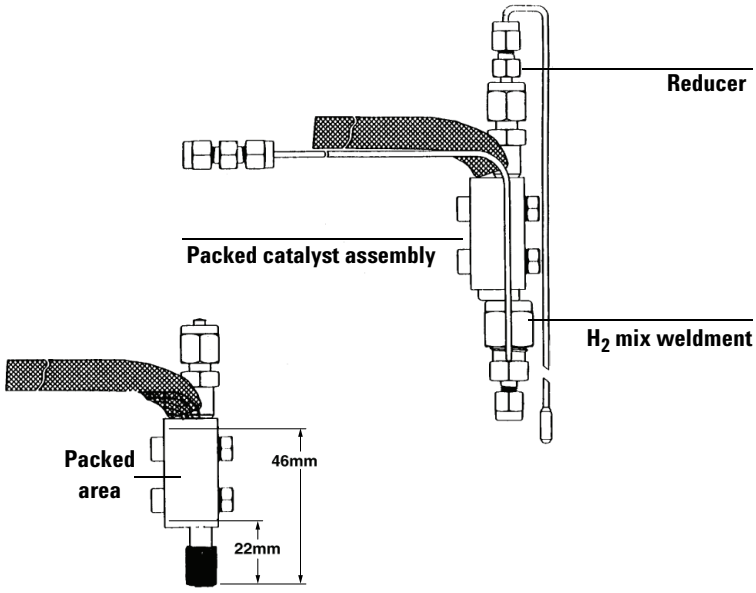
Due to the possibility of dermatitis, wash the arms and hands with soap and water after use. Long sleeves are recommended during any use and spill cleanup. If long sleeves are not worn, long gloves are an acceptable substitute.

CAUTION

Be sure to read the Material Safety Data Sheet (MSDS) provided with the catalyst before performing this procedure.

1. Turn off the back inlet thermal zone. Turn off all other heaters. When the NCT has cooled to room temperature, turn off the power to the GC and disconnect the power cord. Bleed down the residual hydrogen and carrier gas pressures.
2. Remove the three screws holding the cover plate on top of the NCT. Remove the plate and the insulation around the NCT.
3. From inside the oven, loosen the two screws holding the insulation cup. Remove the cup and insulation.
4. Use two wrenches to disconnect the H_2 mix weldment from the bottom of the catalyst assembly. Be careful NOT to place

stress on the 1/16-inch tube. Stress can damage the weldment.



5 Use two wrenches to disconnect the reducer from the top of the catalyst assembly.

6 Gently lift the catalyst assembly out of the injection area. Both ends of the catalyst tube are now accessible.

7 Use a hooked instrument to remove the glass wool plug from the bottom of the tube. Make sure you get all of it.

8 Empty the old catalyst from the tube (you may have to break it out with a pointed tool). Make sure you get it all out.

9 Use a thin rod to push out the top glass wool plug from the tube.

10 Clean the inside of the tube thoroughly with methanol. Do not use any sharp metal tools on the inside of the tube. A cotton swab carefully used will ensure cleanliness. Dry the tube.

11 The previous figure shows the dimensions for repacking the tube correctly. If any catalyst is outside the heated zone, severe tailing of CO will result.

Prepare a simple depth gauge using a wooden cotton swab or any other handy rod or tubing. Use tape or paint to mark the stick at 46 mm from the blunt end and at 22 mm from the blunt end.

12 Roll up a piece of glass wool about the size of a large pea. Push this into the tube from the 1/4-inch end and seat it firmly. Measure the depth of this glass wool with the depth gauge—it should be 46 mm from the end of the tube. If necessary, add more glass wool. A slight compression of the glass wool during the measurement works best. The goal is to position the catalyst within the heated block area. Catalyst outside this area can create tailing peaks.

13 Turn the catalyst assembly upside down and add catalyst slowly. Tap gently to help seat it. When the catalyst is 22 mm from the end, stop adding catalyst. Do NOT crush the catalyst when packing or measuring the depth.

14 Add a single glass wool plug to fill the remaining part of the tube to within 5 mm of the end. This plug should be gently compressed during installation.

CAUTION Before installing the catalyst assembly into the oven, carefully wipe it to remove any catalyst dust.

15 Reassembly is the reverse of steps 1 through 6.

Make sure that the insulation is carefully repacked around the tube before you reinstall the injector cover plate and the insulation cup.

16 Leak test the new installation.

WARNING **Hydrogen (H_2) is flammable and is an explosion hazard when mixed with air and confined in an enclosed space (for example, the oven).**

17 Start the carrier and hydrogen flows. Allow them to flow for 15 minutes.

18 Heat the nickel catalyst to 375°C and hold for 1 hour.

The accessory is ready for use.

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